Standard Performance Schottky Generic PROM Family 53/63XX-1

Features/Benefits

- Standard Schottky processing
- Reliability proven nichrome fusible links (qualified for MIL-M-38510)
- Drop in compatible ROMs
- PNP inputs for low input current
- Compatible pin configurations for upward expansion
- 4-bit-wide and 8-bit-wide for byte oriented applications

Application

- Microprogram instruction
- Microprocessor program store
- Look up table
- Character generator
- Random logic
- Code converter

Description

The 53/63XX-1-series generic PROM family offers the widest selection of sizes and organizations available in the industry. The 4-bit-wide PROMs range from 256x4 to 1024x4 and feature upward/downward pin out compatibility in the space saving 16 and 18 pin packages. The 8-bit-wide PROMs range from 32x8 to 1024x8 in a wide selection of package sizes. All PROMs have the same programming specifications allowing a single generic programmer.

The family features low input current PNP inputs, full Schottky clamping and Three-state and open collector outputs. The nichrome fuses store a logical high and are programmed to the low state. Special on chip circuitry and extra fuses provide pre-programming tests which assure high programming yields and high reliability.

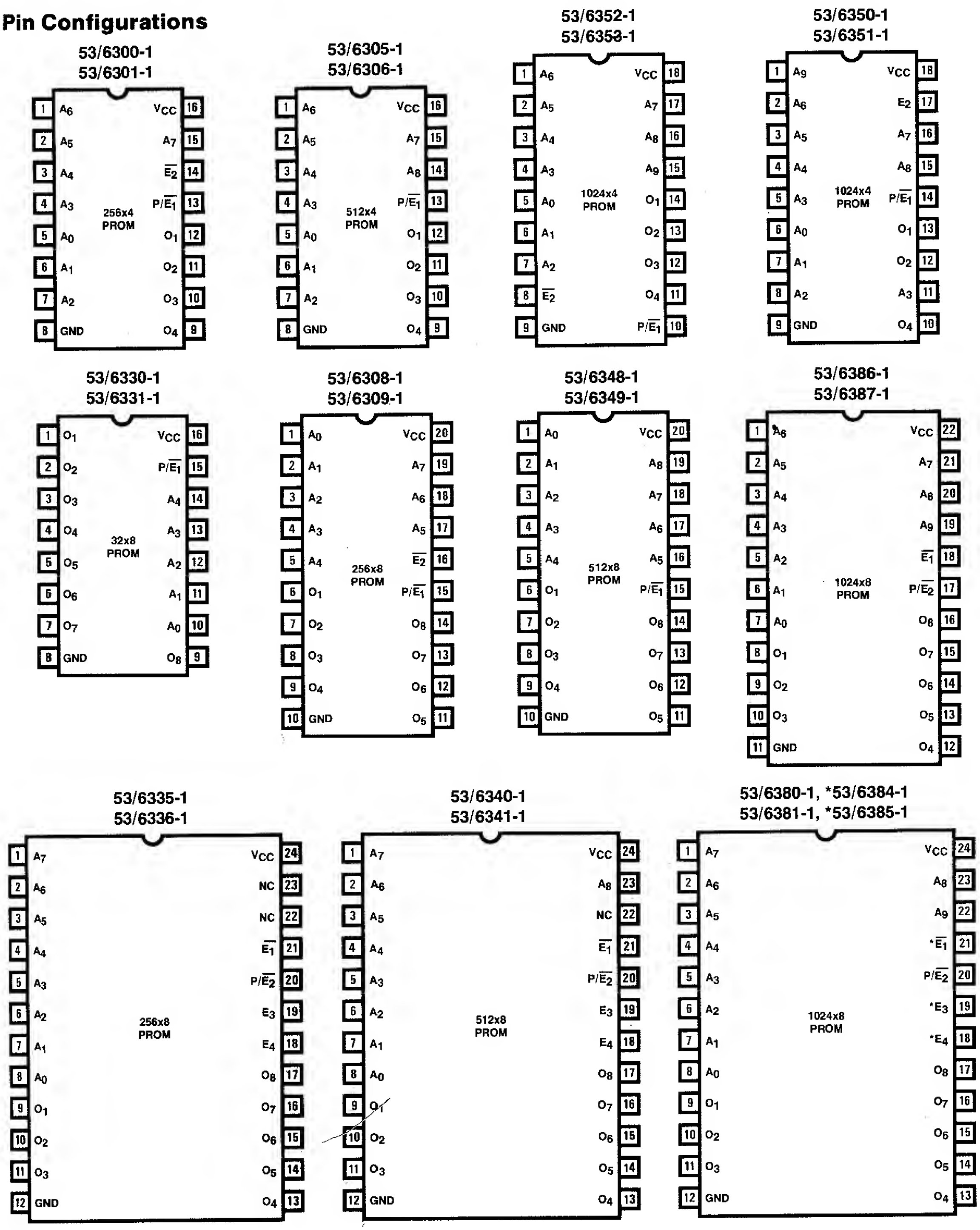
The 63 series is specified for operation over the commercial temperature and voltage range. The 53 series is specified for the military ranges.

Generic PROM Selection Guide

MEMORY			PACKAGE		DEVICE TYPE		INTERCHANGEABLE ROM	
Size	Organization		Pins	Type*	0°C to +75°C	−55°C to +125°C	0°C to +75°C	−55°C to +125°C
1K	256x4	OC	16	J, N, F	6300-1	5300-1	6200-1	5200-1
		TS			6301-1	5301-1	6201-1	5201-1
2K	512x4	OC	16	J, N, F	6305-1	5305-1	6205-1	5205-1
		TS			6306-1	5306-1	6206-1	5206-1
4K	1024x4	OC	18	J, N, F	6350-1	5350-1	6250-1	5250-1
		TS			6351-1	5351-1	6251-1	5251-1
		OC			6352-1	5352-1	6252-1	5252-1
		TS			6353-1	5353-1	6253-1	5253-1
¼K	32x8	OC	16	J, N, F	6330-1	5330-1	6230-1	5230-1
		TS			6331-1	5331-1	6231-1	5231-1
2K	256x8	OC	20	J, N	6308-1	5308-1	—	—
		TS			6309-1	5309-1	—	—
		OC	24	J, N, F	6335-1	5335-1	6235-1	5235-1
		TS			6336-1	5336-1	6236-1	5236-1
4K	512x8	OC	24	J, N, F	6340-1	5340-1	6240-1	5240-1
		TS			6341-1	5341-1	6241-1	5241-1
		OC	20	J, N	6348-1	5348-1	—	—
		TS			6349-1	5349-1	—	—
8K	1024x8	OC	24	J, N, F	6380-1	5380-1	6280-1	5280-1
		TS			6381-1	5381-1	6281-1	5281-1
		OC			6384-1	5384-1	6284-1	5284-1
		TS			6385-1	5385-1	6285-1	5285-1
		OC	22	J	6386-1	5386-1	6286-1	5286-1
		TS			6387-1	5387-1	6287-1	5287-1

*Package Types: N is Plastic DIP, J is Ceramic DIP and F is Flat Pak

Pin Configurations



*NO CONNECTION Replacement for 2708 EPROM.

NOTE: Pin assignments for ceramic (J package), plastic (N package) and flat pack (F package) are the same.

Absolute Maximum Ratings

Supply Voltage, V_{CC} .... −0.5V to +7.0V
Input Voltage .... −1.5V to +5.5V
Input Current .... −20 mA to +5 mA
Output Current .... −100 mA to +100 mA
Storage Temperature Range .... −65°C to +150°C

Recommended Operating Conditions

SYMBOL	PARAMETER		53' (Military) MIN	NOM	MAX	63' (Commercial) MIN	NOM	MAX	UNIT
V_{CC}	Supply Voltage		4.5	5.0	5.5	4.75	5.00	5.25	V
I_{OH}	High Level Output Current				−2.0			−3.2	mA
I_{OL}	Low Level Output Current	'00, '01, '05, '06, '08, '09, '40, '41, '48, '49, '50, '51, '52, '53			12			16	mA
		'30, '31, '35, '36, '80, '81 '84, '85, '86, '87			8			12	mA
T_A	Operating Free Air Temperature		−55		125	0		75	°C

Electrical Characteristics

Over Recommended Operating Free Air Temperature Range (Unless Otherwise Noted)

SYMBOL	PARAMETER		CONDITIONS		MIN	TYP	MAX	UNIT
V_{IH}	High Level Input Voltage				2.0			V
V_{IL}	Low Level Input Voltage						0.8	V
V_{IC}	Input Clamp Voltage		V_{CC} = Min, I_I = −18mA				−1.5	V
V_{OL}	Low Level Output Voltage		V_{CC} = Min, I_{OL} = Max				0.50	V
I_I	Maximum Input Current		V_{CC} = Max, V_I = 4.5V (Program Pin) V_I = 5.5V (Other Inputs)				1.0	mA
I_{IH}	High Level Input Current		V_{CC} = Max, V_I = 2.4V				40	μA
I_{IL}	Low Level Input Current		V_{CC} = Max, V_I = 0.45V				−250	μA
C_I	Input Capacitance		V_{CC} = 5.0V T_A = 25°C f = 1 MHz	V_I = 2.0V		7		pF
C_O	Output Capacitance			V_O = 2.0V		8		pF
I_{CC}	Supply Current	'30, '31	V_{CC} = Max All inputs grounded All outputs open			90	125	mA
		'00, '01, '05, '06				95	130	
		'08, '09,'48, '49				115	155	
		'35, '36, '40, '41				125	170	
		'50, '51, '52, '53				130	175	
		'80, '81, '84, '85, '86, '87				135	180	

OPEN COLLECTOR OUTPUT CURRENT

I_{CEX}	Output Leakage Current	V_{CC} = Max, V_O = 2.4V			100	μA

THREE STATE OUTPUT ONLY

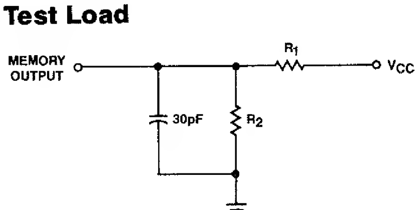
V_{OH}	High Level Output Voltage	V_{CC} = Min, I_{OH} = Max	2.4			V
I_{HZ}	High Level OFF State Output Current	V_{CC} = Max, V_O = 2.4V			100	μA
I_{LZ}	Low Level OFF State Output Current	V_{CC} = Max, V_O = 0.5V			−100	μA
I_{OS}	Output Short Circuit Current	V_{CC} = 5.0V, V_O = 0V	−20		−90	mA

Switching Characteristics

Over Recommended Ranges of T_A and V_{CC} (Unless Otherwise Noted)

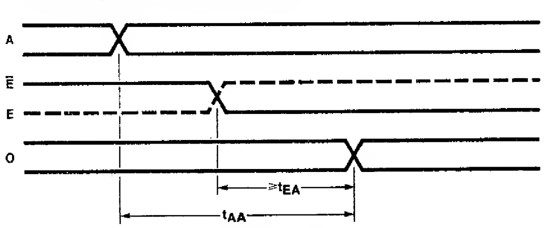
DEVICE TYPE	CONDITIONS (See standard test load)		t_{AA} (ns) ADDRESS ACCESS TIME	t_{EA} & t_{ER} (ns) ENABLE ACCESS & RECOVERY TIME
	R_1 (Ω)	R_2 (Ω)	MAX	MAX
6300-1, 6301-1	300	600	55	30
5300-1, 5301-1	375	750	75	30
6305-1, 6306-1	300	600	60	30
5305-1, 5306-1	375	750	75	40
6308-1, 6309-1	300	600	70	30
5308-1, 5309-1	375	750	80	40
6330-1, 6331-1	375	750	50	30
5330-1, 5331-1	560	1120	60	30
6335-1, 6336-1	375	750	70	30
5335-1, 5336-1	560	1120	80	40
6340-1, 6341-1	300	600	70	30
5340-1, 5341-1	375	750	80	40
6348-1, 6349-1	300	600	70	30
5348-1, 5349-1	375	750	80	40
6350-1, 6351-1	300	600	60	30
5350-1, 5351-1	375	750	75	40
6352-1, 6353-1	300	600	60	30
5352-1, 5353-1	375	750	75	40
6380-1, 6381-1	375	750	90	40
5380-1, 5381-1	560	1120	125	40
6384-1, 6385-1	375	750	90	40
5384-1, 5385-1	560	1120	125	40
6386-1, 6387-1	375	750	90	40
5386-1, 5387-1	560	1120	125	40

Standard Test Load

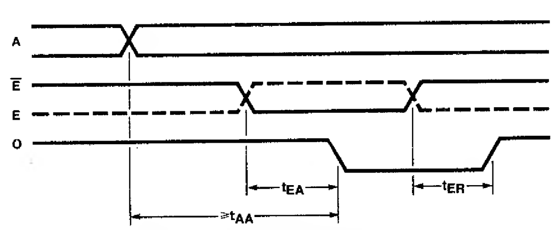


Input Pulse Amplitude 3.0V
Input Rise and Fall Times 5ns from 1.0V to 2.0V
Measurements Made at 1.5V

Definition of Waveforms



ADDRESS ACCESS TIME



ENABLE ACCESS TIME AND RECOVERY TIME

Standard Performance Schottky PROM Programming Instructions 53/63XX-1

Device Description

The 53/63XX-1 Generic PROM Family is manufactured with all outputs high in all storage locations. To make an output low at a particular word, a nichrome fusible link must be changed from a low resistance to a high resistance. This procedure is called programming.

Programming Description

To select a particular fusible link for programming, the word address is presented with TTL levels on all inputs a V_{CC} of 5.50V is applied or left applied, and the program pin (ordinarily an enable input) and the output to be programmed are taken to an elevated voltage to supply the required current to program the fuse. The outputs must be programmed one output at a time, since internal decoding circuitry is capable of sinking only one unit of programming current at a time.

Other Enable Inputs

Other enable inputs are logic enables and are not used during programming. They may be high, low or open during programming. When checking that an output is programmed (which is called verification), the PROM must be enabled. The simplest procedure is to tie other enables into the enable position for programming and verification.

Programming Instructions

Timing

The programming procedure involves the use of the program pin (an enable) and the output pin. In order to guarantee that the output transistor is off before increasing the voltage on the output pin, the program pin's voltage pulse must come before the output pin's programming pulse. The programming pulse applied to the output pin and program pin must have a rise time rate of 0.34V/μsec to 0.46V/μsec.

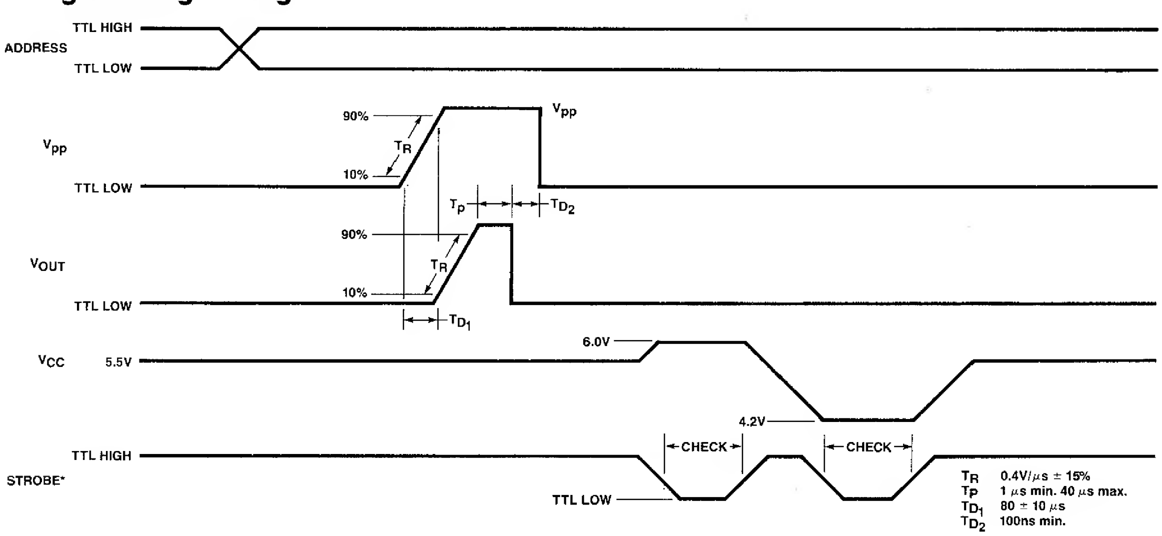
Verification

After programming a device, it can be checked for a low output by enabling the part. Since we must guarantee operation at minimum and maximum V_{CC}, load current and temperature, the device must be required to sink 12mA at 4.2V V_{CC} and 0.2mA at 6.0V V_{CC} at room temperature.

Unprogrammable Units

Visual inspection at 200X prior to encapsulation, test fuses and decoding circuitry tests are used to guarantee a high programming yield of the device in the field. However, because of random defects, it is impossible to guarantee that a link will open without actually programming it. Units returned to MMI as unprogrammable must be accompanied by a complete device truth table clearly indicating the location which could not be programmed, or which was falsely programmed. Otherwise, failure analysis is impossible.

Programming Timing



*Note: Output Load = 0.2mA during 6.0V check.
Output Load = 12mA during 4.2V check.

Programming Parameters

Do not test these parameters or you may program the device.

SYMBOL	PARAMETER	TEST CONDITIONS	LIMITS MIN	LIMITS TYP	LIMITS MAX	UNIT
t_R	Rise Time of Program Pulse Applied Data Out or Program Pin		0.34	0.40	0.46	V/μs
V_{CCP}	V_{CC} Required During Programming		5.40	5.50	5.60	V
I_{OLV_1}	Output Current Required During Verification	Chip Enabled $T_A = +25°C$, $V_{CC} = 4.2V$	11	12	13	mA
I_{OLV_2}	Output Current Required During Verification	Chip Enabled $T_A = +25°C$, $V_{CC} = 6.0V$	0.10	0.2	0.30	mA
MDC	Maximum Duty Cycle During Automatic Programming of Program Pin and Output Pin	t_P/t_C			25	%
V_{PP}	Required Programming Voltage on Program Pin		27	27	33	V
V_{out}	Required Programming Voltage on Output Pin		20	20	26	V
I_L	Current Limit of Power Supply Feeding Program Pin and Output During Programming	$V_{PP} = 33V$, $V_{out} = 26V$, $V_{CC} = 5.50V$	240			mA
t_{D1}	Required Time Delay Between Disabling Memory Output and Application of Output Programming Pulse	Measure at 10% Levels	70	80	90	μs
t_{D2}	Required Time Delay Between Removal of Programming Pulse and Enabling Memory Output	Measure at 10% Levels	100			ns

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Programming Speed

Typically, fuses will blow on the rise time of the first pulse. In automated programmers which must copy devices in a short time because of the production requirements, the following pulse and voltage sequences have been found to maximize reliability, programming yield and throughput. The device should be verified after each programming attempt and be advanced to the next bit if the device has programmed.

PULSE NUMBER	PROGRAM PIN VOLTAGE	OUTPUT VOLTAGE
1 to 3	27V	20V
4 to 6	30V	23V
7 to 9	33V	26V

NOTE: The 5330/1 and 6330/1 do not have a program pin. For these devices the output only is used in programming a particular selected bit and the device must be in the disabled state.

Commercial Programmers

MMI PROMs are designed and tested to give a programming yield greater than 95%. Field reports agree with this expectation. Several companies make commercial programmers which will properly program MMI PROMs. MMI makes it a practice to review these commercial programmers and works closely with the manufacturers to maintain a high programming yield and high reliability of programmed parts. If your programming procedures have a lower yield, then check your programmer. It may not be properly calibrated for the "Dash-One" series of PROMs—53xx-1 and 63xx-1. Calibration must agree with the timing charts supplied in this publication. Monolithic Memories intends a systematic review of commercially available programmers, and will periodically issue a list of approved models.

Programming is final manufacturing—it must be quality-controlled. Equipment must be calibrated as a regular routine, ideally under the actual conditions of use. The best method involves a storage scope, with DC current probes clamped over the external wires to the program pin and the output pin. The current should not be limited at a value less than 240mA. This can be checked by using a 50-ohm resistor as a load. Each time a new board or a new programming module is inserted, the whole system should be checked. Both timing and voltages must meet published specifications for the device.

Remember—The best PROMs available can be made unreliable by improper programming techniques.